

AMENDMENTS TO THE CLAIMS:

The following listing of claims replaces all prior listings, and all prior versions, of claims in the application:

Listing of Claims:

1. (Previously Presented) A semiconductor device with a multilayered structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, and a neighboring film formed in contact with said copper film interconnect, wherein said neighboring film includes a ruthenium film which substantially prevents voids due to electromigration of copper of the copper film, and said copper film interconnect has a multilayered structure comprising a copper film as formed through sputtering and a copper film as formed through plating.

2. (Previously Presented) A semiconductor device with a multilayered structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, and a neighboring film formed in contact with said copper film interconnect, wherein said neighboring film includes a ruthenium film which substantially prevents voids due to electromigration of copper of the copper film, and said copper film interconnect has a multilayered structure comprising a copper film as formed through physical vapor deposition and a copper film as formed through chemical vapor deposition.

3. (Currently Amended) A semiconductor device with a multilayered structure comprising a copper film interconnect formed on one primary surface of a

semiconductor substrate, a neighboring film formed in contact with said copper film interconnect, and a dielectric film positioned such that the neighboring film is between the dielectric film and the copper film interconnect, wherein said neighboring film is formed of ruthenium as the primary constituent element, and is formed through sputtering, and said copper film interconnect has a multilayered structure comprising a copper film as formed through sputtering and a copper film as formed through plating or chemical vapor deposition, whereby voids due to electromigration of the copper is substantially avoided.

4. (Previously Presented) A semiconductor device with a structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, and a plug formed in contact with said copper film interconnect, wherein said plug includes at least one film selected from the group consisting of a rhodium film, a ruthenium film, an iridium film, an osmium film and a platinum film, which substantially prevents voids due to electromigration of copper of the copper film, and at least one of said copper film interconnect and said plug contains a layer as formed through physical vapor deposition.

5. (Previously Presented) A semiconductor device with a structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, a neighboring film formed in contact with said copper film interconnect, and a plug formed in contact with said neighboring film, wherein said neighboring film is formed of ruthenium as the primary constituent element, said plug is formed of ruthenium as the primary constituent element, and at least one of said

copper film interconnect and said plug contains a layer as formed through physical vapor deposition.

6. (Previously Presented) A semiconductor device with a structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, a neighboring film formed in contact with said copper film interconnect, a plug formed in contact with said neighboring film, and a diffusion barrier formed in contact with said plug and said neighboring film, wherein said neighboring film includes a ruthenium film, said plug is formed of a ruthenium film, said diffusion barrier is formed of a titanium nitride film, and at least one of said copper film interconnect and said neighboring film is a film formed through sputtering, wherein the neighboring film and the plug substantially prevent voids due to electromigration of the copper or platinum of the copper or platinum film.

7.-8. (Cancelled).

9. (Previously Presented) A semiconductor device having a layered interconnection structure including a copper film or a platinum film formed overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the copper or platinum film and a neighboring film adjacent the copper or platinum film, the neighboring film including a material selected from a first group consisting of rhodium, ruthenium, iridium, osmium and platinum when the layered interconnection structure includes a copper film and the neighboring film including a material selected from a second group consisting of rhodium, ruthenium, iridium and

osmium when the layered interconnection structure includes a platinum film, at least one of (a) the copper or platinum film and (b) the neighboring film being a film made by physical vapor deposition, the device further comprising a diffusion barrier layer, said neighboring film being sandwiched between said copper or platinum film and said diffusion barrier layer, wherein the neighboring film substantially prevents voids due to electromigration of the copper or platinum of the copper or platinum film.

10. (Previously Presented) The semiconductor device according to claim 9, wherein the neighboring film is in contact with the copper or platinum film, and the diffusion barrier layer is in contact with the neighboring film.

11. (Cancelled).

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12. (Currently Amended) The semiconductor device according to claim 44 38, wherein the diffusion barrier layer is at least one film made of material selected from the group consisting of titanium nitride, tungsten and tantalum.

13. (Currently Amended) The semiconductor device according to claim 44 38, wherein the platinum film is a film formed by physical vapor deposition.

14. (Currently Amended) The semiconductor device according to claim 44 38, wherein said neighboring film is a film formed by physical vapor deposition.

15. (Currently Amended) The semiconductor device according to claim 14, 38, wherein both the neighboring film and the platinum film are films formed by physical vapor deposition.

16. (Previously Presented) The semiconductor device according to claim 9, wherein the layered interconnection structure includes the copper film.

17. (Previously Presented) The semiconductor device according to claim 16, wherein the diffusion barrier layer is at least one film made of material selected from the group consisting of titanium nitride, tungsten and tantalum.

18. (Previously Presented) The semiconductor device according to claim 16, wherein the copper film is a film formed by physical vapor deposition.

19. (Previously Presented) The semiconductor device according to claim 16, wherein said neighboring film is a film formed by physical vapor deposition.

20. (Previously Presented) The semiconductor device according to claim 16, wherein both the neighboring film and the copper film are films formed by physical vapor deposition.

21. (Cancelled)

22. (Previously Presented) The semiconductor device according to claim 9, further comprising an insulating film overlying the layered interconnection structure and having a contact hole therethrough exposing the layered interconnection structure, the contact hole having an electrically conductive plug therethrough in electrical contact with the layered interconnection structure, and with another layered interconnection structure on the insulating film and electrically contacting the electrically conductive plug.

23. (Previously Presented) The semiconductor device according to claim 22, wherein the electrically conductive plug is a plug formed by physical vapor deposition.

24. (Previously Presented) The semiconductor device according to claim 22, wherein the another layered interconnection structure includes a copper film or a platinum film and a further neighboring film between the plug and the copper or platinum film, said further neighboring film being made of a material selected from said first group when the another layered interconnection structure includes a copper film, and being made of a material selected from said second group when the another layered interconnection structure includes a platinum film.

25. (Previously Presented) The semiconductor device according to claim 24, further comprising another diffusion barrier layer between the plug and the further neighboring film, wherein the another diffusion barrier layer is at least one film made

of material selected from the group consisting of titanium nitride, tungsten and tantalum.

26. (Cancelled).

27. (Previously Presented) A semiconductor device having a layered interconnection structure including a copper film formed overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the copper film and a neighboring film adjacent the copper film, the neighboring film including a material selected from a group consisting of rhodium, ruthenium, iridium, osmium and platinum, at least one of (a) the copper film and (b) the neighboring film being a film made by physical vapor deposition, wherein the neighboring film substantially prevents voids due to electromigration of copper of the copper film.

28. (Previously Presented) The semiconductor device according to claim 27, further comprising another neighboring film, adjacent a side of the copper film opposite a side thereof having said neighboring film adjacent thereto, said another neighboring film being made of a material selected from the group consisting of rhodium, ruthenium, iridium, osmium and platinum.

29. (Previously Presented) The semiconductor device according to claim 28, wherein both the neighboring film and the another neighboring film are films formed by physical vapor deposition.

30. (Currently Amended) A semiconductor device having a layered interconnection structure including a copper film formed overlying a surface of a semiconductor substrate, and having a dielectric film overlying the surface of the semiconductor substrate, wherein the layered interconnection structure includes the copper film and a neighboring film adjacent the copper film, the neighboring film containing a material selected from a group consisting of rhodium, ruthenium, iridium, osmium and platinum as the primary constituent element, at least one of (a) the copper film and (b) the neighboring film being a film made by physical vapor deposition, and wherein the dielectric film is positioned such that the neighboring film is between the copper film and the dielectric film, whereby voids due to electromigration of the copper is substantially avoided.

31. (Previously Presented) A semiconductor device having a layered interconnection structure including a copper film or a platinum film formed overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the copper or platinum film and a neighboring film adjacent the copper or platinum film, the neighboring film having, as the primary constituent element thereof, an element selected from a first group consisting of rhodium, ruthenium, iridium, osmium and platinum when the layered interconnection structure includes a copper film, and the neighboring film has, as the primary constituent element thereof, an element selected from a second group consisting of rhodium, ruthenium, iridium and osmium when the layered interconnection structure includes a platinum film, at least one of (a) the copper or platinum film and (b) the neighboring film being a film made by physical vapor deposition, the device further comprising a diffusion barrier

layer, said neighboring film being sandwiched between said copper or platinum film and said diffusion barrier layer.

32. (Previously Presented) A semiconductor device with a multilayered structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, and a neighboring film formed in contact with said copper film interconnect, wherein said neighboring film is formed of ruthenium as the primary constituent element, and is formed through sputtering, so as to restrain formation of voids due to electromigration of copper of the copper film interconnect, and said copper film interconnect has a multilayered structure comprising a copper film as formed through sputtering and a copper film as formed through plating or chemical vapor deposition.

33. (Previously Presented) A semiconductor device having a layered interconnection structure including a copper film formed overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the copper film and a neighboring film adjacent the copper film, the neighboring film containing a material selected from a group consisting of rhodium, ruthenium, iridium, osmium and platinum as the primary constituent element, at least one of (a) the copper film and (b) the neighboring film being a film made by physical vapor deposition, wherein the neighboring film restrains formation of voids due to electromigration of copper of the copper film.

34. (Previously Presented) A semiconductor device having a layered interconnection structure including a copper film or a platinum film formed overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the copper or platinum film and a neighboring film adjacent the copper or platinum film, the neighboring film having, as the primary constituent element thereof, an element selected from a first group consisting of rhodium, ruthenium, iridium, osmium and platinum when the layered interconnection structure includes a copper film, and the neighboring film has, as the primary constituent element thereof, an element selected from a second group consisting of rhodium, ruthenium, iridium and osmium when the layered interconnection structure includes a platinum film, at least one of (a) the copper or platinum film and (b) the neighboring film being a film made by physical vapor deposition, the device further comprising a diffusion barrier layer, said neighboring film being sandwiched between said copper or platinum film and said diffusion barrier layer, wherein the neighboring film restrains formation of voids due to electromigration of copper or platinum of the respective copper or platinum film.

35. (Previously Presented) A semiconductor device having a layered interconnection structure including a copper film overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes a neighboring film and the copper film overlying the neighboring film, the neighboring film including a material selected from a group consisting of rhodium, ruthenium, iridium, osmium and platinum, and at least one of (a) the copper film and (b) the neighboring film being a film made by physical vapor deposition, wherein the

neighboring film substantially prevents voids due to electromigration of the copper film.

36. (Currently Amended) A semiconductor device having a layered interconnection structure including a copper film overlying a surface of a semiconductor substrate, and having a dielectric film overlying the surface of the semiconductor substrate, wherein the layered interconnection structure includes the copper film and a neighboring film located at at least one of (a) overlying the copper film and (b) between the copper film and the substrate, the neighboring film including a material selected from a group consisting of rhodium, ruthenium, iridium, osmium and platinum as the primary constituent element, at least one of (a) the copper film and (b) the neighboring film being a film made by physical vapor deposition, and wherein the dielectric film is positioned such that the neighboring film is between the copper film and the dielectric film, whereby voids due to electromigration of the copper is substantially avoided.

37. (Previously Presented) A semiconductor device having a layered interconnection structure including a copper film or a platinum film formed overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the copper film or the platinum film, and a neighboring film located at at least one of (a) overlying the copper film or the platinum film and (b) between the copper film or the platinum film and the substrate, the neighboring film including an element selected from a first group consisting of rhodium, ruthenium, iridium, osmium and platinum when the layered interconnection structure includes the copper

film and the neighboring film including an element selected from a group consisting of rhodium, ruthenium, iridium and osmium when the layered interconnection structure includes the platinum film, at least one of (a) the copper film or platinum film and (b) the neighboring film being a film made by physical vapor deposition, wherein the neighboring film substantially prevents voids due to electromigration of platinum when the layered interconnection includes the platinum film and the neighboring film substantially prevents voids due to electromigration of copper when the layered interconnection includes the copper film.

38. (New) A semiconductor device having a layered interconnection structure including a copper film or a platinum film formed overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the copper or platinum film and a neighboring film adjacent the copper or platinum film, the neighboring film including a material selected from a first group consisting of rhodium, ruthenium, iridium, osmium and platinum when the layered interconnection structure includes a copper film and the neighboring film including a material selected from a second group consisting of rhodium, ruthenium, iridium and osmium when the layered interconnection structure includes a platinum film, at least one of (a) the copper or platinum film and (b) the neighboring film being a film made by physical vapor deposition, the device further comprising a diffusion barrier layer, said neighboring film being sandwiched between said copper or platinum film and said diffusion barrier layer, wherein the neighboring film substantially prevents voids due to electromigration of the copper or platinum of the copper or platinum film, and wherein the layered interconnection structure includes the platinum film.